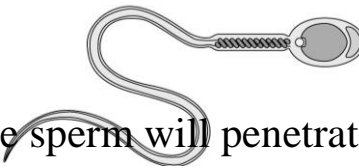


Development

- Fertilization results in a zygote and triggers embryonic development
- The shape of a human sperm cell is adapted to its function



- Only one of these sperm will penetrate this human egg cell to initiate fertilization

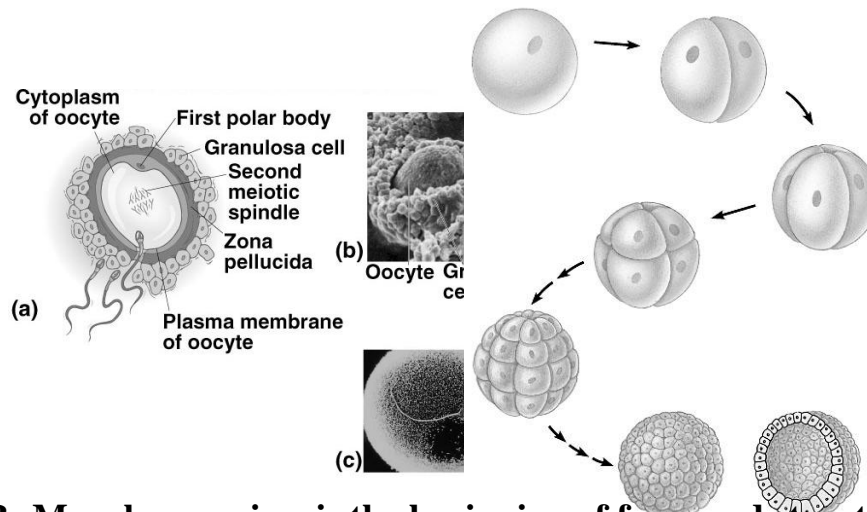
Three Stages of Fertilization

- Penetration
- Activation
- Fusion

I. Early stages of development

A. Cleavage - When the original zygote cleaves into many smaller cells by the process of mitosis

1. **Blastula - the group of cells that form as a result of cleavage**
 - a. **Blastocoel - when the blastula forms a hollow portion within the ball of cells**
2. **In all more complex animals a yolk forms in what is called the vegetal pole**



B. Morphogenesis - is the beginning of form and structure of the organism (Structure Beginning)

1. **Gastrulation - is when the blastula further develops into three distinct development layers called germ layers**
2. **Gastrula - is the result of gastrulation**

- a. The lower cavity called the archenterons forms from the endoderm and will form the digestive tract

C. Neurulation

- 1. Forming of the neural tube out of ectoderm

II. Control and differentiation - all animal and plant nuclei have all the information to develop a complete new organism

- A. Embryonic induction - When one part of an embryo influence

- B. Differentiation - when the developmental layers begin to form into specialized parts

- C. Primary induction - inductions between the three primary tissue types are referred to as

- 1. When one part of an embryo influence

- 2. Stem Cells are cells from early development that can develop into any type of cell

- D. Secondary induction - inductions between tissues that have already been differentiated

- 1. Inducers - a chemical (hormone) that cause cells to develop into special parts

III. Patterns of animal development

- A. Metamorphosis – A series of form changes in development

- 1. Amphibians

- 2. Insects

- B. Twinning

- 1. Fraternal twins - are from separate sperm and different eggs

- 2. Identical twins - When the cells of the blastula or gastrula separate into two cell masses

IV. Amniotic Egg

- 1. Tough leathery shell or brittle shell

- 2. membranes

a. amnion

- 1) fluid sac that surrounds the embryo

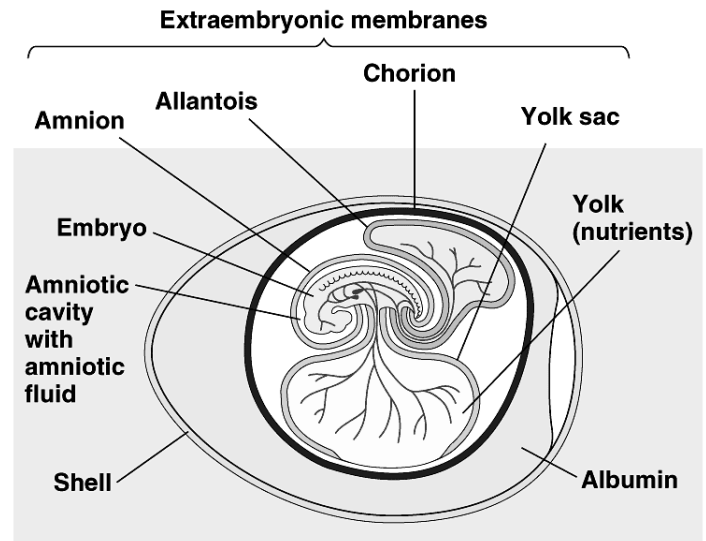
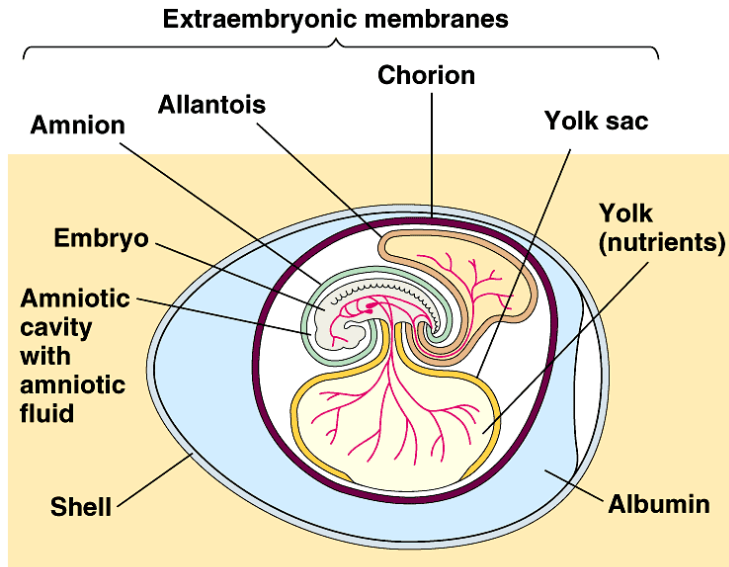
- b. Allantois - a membrane sac connected to the digestive region of the embryo

- 1) Embryonic garbage bag

- 2) Also allows gas exchange

- c. Yolk sac - also attached to the digestive tract to provide food to the embryo

d. Chorion - the membrane just below the shell allows gas exchange



B. Internal development

1. **Human development begins with fertilization in the oviduct**
2. **A placenta – formed instead of allantois for food gas and waste exchange between mother and embryo**
3. **Development of the Placenta p 530**
 - a. **Implantation**
 - b. **Amnion - begins to form around the embryo**
 - c. **Chorion begins to grow into the uterine wall.**
 - d. **Small blood vessels, & capillaries develop from the allantois and become part of the placenta**
 - e. **The rest of the placenta is uterine tissue**
4. **Function of the placenta**
 - a. **Provides food and oxygen for the embryo that is removed by diffusion from the mothers blood**
 - 1) **Crosses a membrane and goes into the embryos blood without the two blood systems coming into contact with each other.**
 - b. **Removes wastes from the embryos blood into the mothers blood**
 - c. **The umbilical cord is a blood vessel filled chord that attaches the embryo to the placenta**
 - d. **Blood from the embryos right ventricle goes directly into the umbilical cord and to the placenta**
5. **The placenta allows for a variety of substances to pass from mother to fetus**
 - a. **Protective antibodies**

- b. German measles virus
- c. HIV
- d. Drugs (prescription and nonprescription)
- e. Alcohol
- f. Chemicals in tobacco smoke

C. Birth in humans

1. As development proceeds, the embryo causes the uterus to expand.
2. After 8 weeks the embryo is called a fetus
3. *Gestation* lasts 266 days
4. This span is divided into 3 trimesters
 - a. First trimester all systems form up to(- 12 weeks)
 - 1) First three months
 - 2) The most rapid changes occur during the first trimester
 - 3) fourth week - organ development
 - 4) organogenesis
 - 5) Second month - morphogenesis
 - i. limbs assume adult shape
 - ii. major organs become evident
 - iii. embryo is about one inch in length
 - b. Second trimester the fetus grows and develops(12-24 weeks)
 - 1) Increase in size of fetus
 - 2) General refinement of human features
 - c. Third trimester triples in size (24-40 weeks)
 - 1) Growth and preparation for birth
 - 2) Third trimester - pace of growth accelerates
 - 3) weight of fetus more than doubles
 - 4) most major nerve tracts formed within brain
 - 5) by end, fetus is able to survive on own

5. Birth

- a. Mother produces hormone that causes contractions of the uterus to begin
- b. The amniotic sac breaks and fluid around the baby comes out of uterus
- c. The cervix dilates to 10 cm and vagina also dilates



- d. The muscular contractions of the uterus push the baby out head first p. 537
 - 6. Three stages of labor
 - a. Dilation of the cervix is the first stage
 - 1) Cervix reaches full dilation at 10cm
 - 2) Longest stage of labor (6-12 hours or longer)
 - b. Expulsion is the second stage
 - 1) Period from full dilation of the cervix to delivery of the infant
 - 2) Uterine contractions occur every 2-3 minutes
 - 3) Mother feels urge to push down with her abdominal muscles
 - 4) Infant is forced down and out of uterus and vagina within a period of 20 minutes
 - c. The delivery of the placenta is the final stage of labor
 - 1) Usually occurs within 15 minutes after the birth of the baby
- D. Humans continue to grow and develop into their teens and early twenties**

